RECENT CHANGES IN PRICE LEVELS AND THEIR CAUSES.

By Irving Fisher.

I find myself unable to agree with most of the positions taken by Professor Laughlin in his able paper. In my opinion the old quantity theory is in essence correct. What it needs is to be re-stated, not rejected. I have attempted to make what I believe to be the needed restatement in a forthcoming book on "The Purchasing Power of Money", Chapter XII of which I have had reprinted for distribution at this meeting.[1] I shall confine myself chiefly in the paper this morning to describing the contents of this chapter. The chapter does not attempt to discuss the theoretical determination of price levels, as this has been discussed in previous chapters. The aim, rather, is to work out quantitatively the statistics pertaining to the rise of prices during the last fifteen years.

Before, however, considering these statistics I may state, in a few words, my creed as to the causation of price levels. This is, according to my view, entirely distinct from the causation of the price of any individual commodity. It is just as impossible to determine the general level of prices by the supply and demand of individual commodities as to determine the general tidal level of the ocean by the winds affecting individual waves. Waves and tides are distinct and require distinct explanations. Likewise prices and price-levels are distinct and require distinct explanations. Just as each wave presupposes a general tidal level with reference to which it is measured, so the supply and demand of each individual commodity presupposes a general level of prices. Each supplier and demander expresses his supply and demand in terms of money and he does so on the assumption of a given purchasing power of money. With a change in the purchasing power there will be a change in his particular supply and demand. Thus the discussion of individual prices presupposes a general price level. The proper order of study is from a general price level to particular prices rather than from particular prices to a general price level.

[1] By the courtesy of the Macmillan Company we are permitted to publish this material and to make use of the diagrams contained therein.

Supply and *demand* are terms which help in the discussion of individual prices but not in the consideration of the general price level. The latter is determined in a simpler way, namely, by the equation of exchange, $MV + M'V' = PT$. This equation expresses algebraically the old quantity theory of money, with some elaboration. It is discussed in Professor Simon Newcomb's able and interesting work "Principles of Political Economy", in President Hadley's "Economics", in Professor Kemmerer's "Money and Prices", and elsewhere. In this equation M signifies the quantity of money in circulation; V, its velocity of circulation, or rate of turnover per annum; M', the volume of deposits subject to check; and V', its velocity of circulation, or rate of turnover per annum. T signifies the volume of trade (considered irrespective of the price level; in other words, reckoned for a given price level as an assumed base); and P the general level of prices resulting from the other five magnitudes in the equation. While it is true that the equation does not enable us to judge which of the magnitudes in it are causes, and which are effects, it is possible by other considerations, which I shall not here attempt to discuss, to show that P is the one passive element in the equation—that it is not cause, but effect. Under normal circumstances, and apart from transition periods, an increase in M, or the quantity of money in circulation, will bring about a corresponding increase in M', the volume of deposits subject to check, but will not disturb V, V', or T. It follows, therefore, that P must vary in direct proportion to M. All the possible causal relations between the magnitudes in the equation are fully discussed in various chapters of the book to which I have referred, but the upshot of the matter is that the old quantity theory still remains fundamentally true and that, under normal conditions, the general price level will respond in substantial proportion to the volume of money in circulation. This does not assert, of course, that during any historical period M will be the only factor affecting P; for it usually happens that all of the five factors in the equation which do affect P will change simultaneously. Each of these factors is the result of innumerable antecedent causes but no cause can affect the price level except through one or more of the five factors M, M', V, V', T.

One object of this paper is to show historically what have been the changes in all of these five factors during the last fifteen

years, which changes have accounted for the resulting changes in P. The study is similar to that previously made by Professor Kemmerer, but is more detailed and has attained a higher degree of accuracy, due, chiefly, to statistics which have become available since the publication of Professor Kemmerer's valuable book on "Money and Prices."

It thus comes about that all of the statistics for the five magnitudes are new. In particular the statistics for the velocity of the circulation of money are entirely new and worked out according to a method explained a year ago in the *Journal of the Royal Statistical Society* for December, 1909. It is interesting to observe that previously there have been no figures available for M'. The statistics for so-called "individual deposits" are not statistics of deposits subject to check, for they include savings bank deposits, certificates, and other time deposits not subject to check. It is found that the statistics of deposits subject to check are sometimes only two-thirds of the statistics for individual deposits. The statistics for deposits subject to check have been worked out from the monograph by Professor David Kinley on the "Use of Credit Instruments" and from statistics kindly supplied at my suggestion by Dr. A. Piatt Andrew of the National Monetary Commission for the years 1896, 1899, 1906, 1909. For intermediate years the results were obtained by methods of interpolation.

As the methods of computing these five magnitudes are completely described in the reprint which has been distributed, it will not be necessary for me to go into details. When these five magnitudes have been computed it becomes possible to reckon what the value of P should be as determined by the equation of exchange, assuming that the theory is correct which ascribes the causation of price levels to these five causes working through the equation of exchange. In other words, it is possible to compute P by the formula

$$P = \frac{MV + M'V'}{T}$$

The resulting value for P can thus be compared with the actual statistics for the price level as shown by the statistics of the Bureau of Labor, making due allowances for wages and the prices of securities. The comparison between these two results for P as directly observed and as calculated indirectly from the five

magnitudes on which it depends may be said to supply a verifica-
tion, for those who need it, of the quantity theory of money, and
for those who do not, a verification of the statistics themselves.
The results agree remarkably well as will be seen presently.

There are, however, discrepancies and it is therefore necesary
to correct the various magnitudes so as to make them harmonize
with the equation of exchange. To secure the most probable
results these corrections should be made in all six magnitudes.
It is found that the correction, or doctoring, in most cases is
usually very small—in the majority of cases not being over one
per cent and in almost all instances being less than two per
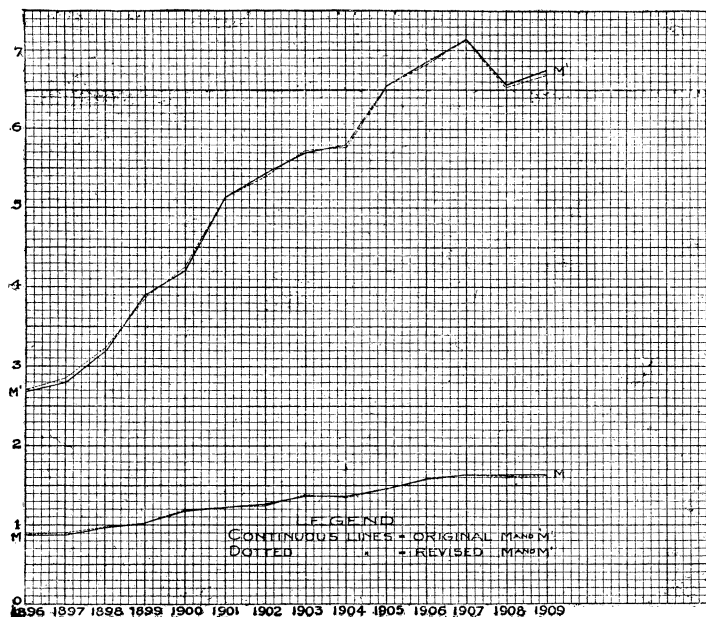cent. The results are shown in the following diagrams. The

FIGURE 1.

first shows in the continuous lines the values of M and M' as
first calculated and in the dotted lines the corrected values. Evi-
dently the dotted line nearly coincides with the continuous line.
In the next figure, which shows the corresponding results for
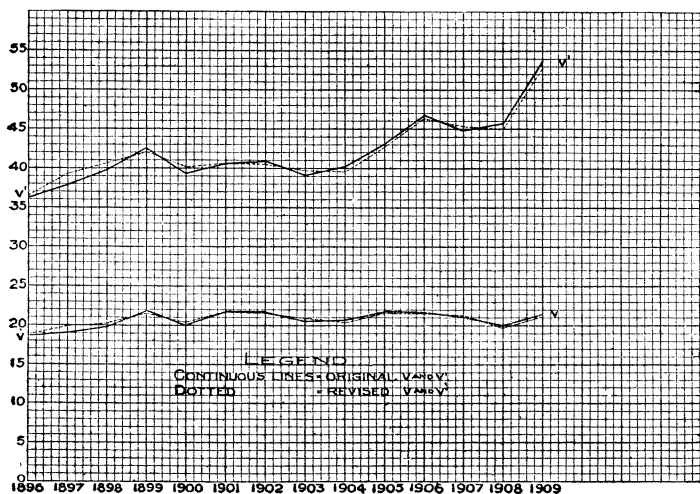V and V', the continuous line gives these as originally calculated

FIGURE 2.

and the dotted lines show the slightly different results as finally
corrected. The third figure shows T as originally and finally
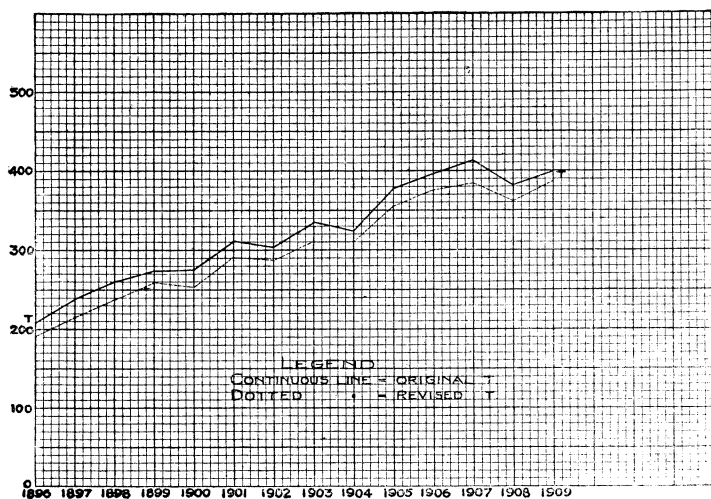calculated; and the fourth figure shows P in three lines. The

FIGURE 3.

upper line gives P as directly computed from statistics; the dotted
line shows this value as finally corrected; while the bottom line
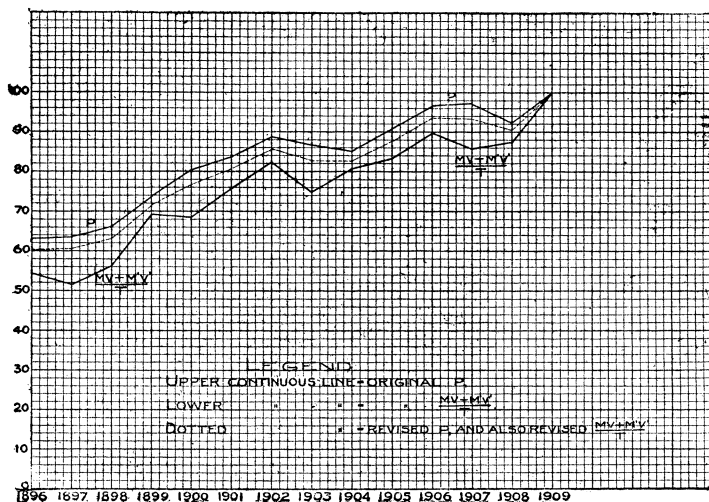shows what this value would be if calculated indirectly from the

FIGURE 4.

other five magnitudes in the equation of exchange. The parallelism between all three lines is evident. The values of the upper and lower lines, or, in other words, the values directly and indirectly calculated, are very close. The application of Karl Pearson's coefficient of correlation shows a high degree of correspondence between these two curves, a correspondence considerably higher than that found for the somewhat similar curves of Professor Kemmerer.

In order to set forth the statistical results which have been given in a manner which will relate together the six magnitudes in the equation of exchange, I have adopted a mechanical picture of the equation of exchange as shown in Figure 5. In this figure

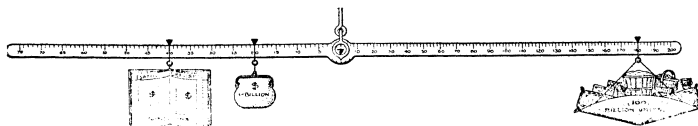
FIGURE 5.

M, the quantity of money in circulation, is represented by a purse; M', by a bank book, both hanging at certain distances from the fulcrum, the distances corresponding to their respective velocities of circulation. On the right in a tray are hung the things which are exchanged during the year, while the distance from the fulcrum at which this tray is hung represents the price level.

This mechanical picture shows that an increase in M, that is in the weight of the purse, other things being equal, will require a readjustment of the point at the right at which the tray hangs. It will need to be pushed farther to the right. If there is an increase in M there will be an increase in P. In like manner P will increase from an increase in M', V, and V', or a decrease in T.

In figure 6 are shown the changes during fourteen years in all of the six magnitudes—M, M', V, V', P, and T. It is shown that the quantity of money in circulation in these years has doubled; the volume of deposits subject to check has about tripled; the velocities of circulation have increased only slightly; and the volume of trade has been doubled. We find that prices rose about two-thirds as a net result of the changes in these five factors, as is shown by the length of the arm at the right. There are interesting variations connected with the panic year 1907. It is interesting to make a quantitative comparison of the various magnitudes with the increase in the quantity of money as the most important factor in raising the price level. While it is true that the volume of deposits subject to check has increased greatly, the major part of the increase has to be ascribed to the increase in the quantity of money. Only so far as the volume of deposits subject to check has increased relatively to the money in circulation, can the increase of deposits be regarded as an independent cause of the rise in prices. We have thus to consider the relative importance of the five causes affecting prices:

1. The quantity of money in circulation (M).
2. The volume of bank deposits subject to check considered relatively to money $\left(\dfrac{M'}{M}\right)$
3. The velocity of the former (V).
4. The velocity of the latter (V').
5. The volume of trade (T).

We may best compare the relative importance of these five magnitudes by answering the question: What would the result have been had any one of these magnitudes remained unchanged during these years, assuming that the other four changed in the same manner that they actually did change. We find (1) that if the money in circulation, M, had not changed, the price level of 1909 would have been 45 per cent lower than it actually was; (2) that if $\dfrac{M'}{M}$, the relative deposits, had not changed, the

price level in 1909 would have been 23 per cent lower than it actually was; (3) if the velocity of circulation of money, V, had not changed, the price level for 1909 would have been 1 per cent lower; (4) if the velocity of circulation of deposits, V′, had not changed, the price level in 1909 would have been 28 per cent lower; (5) if T had not changed, the price level in 1909 would have been 106 per cent *higher.*

Thus the changes in the first four factors have tended to raise prices, while the change in T has tended to lower prices. The relative importance of the four price-raising causes may be stated in terms of the per cent already given which represents how much lower prices would have been except for each of these causes separately considered. According to this test we find the relative importance of the four price-raising factors to be as follows:

The importance of V is represented by 1,

The importance of $\dfrac{M'}{M}$ is represented by 23,

The importance of V′ is represented by 28,

The importance of M is represented by 45.

That is, the increase in the quantity of money has an importance nearly double that of any other one price-raising factor. This study includes all the possible price-raising factors. To be sure, there may be innumerable causes raising the price level, but they can operate only through the four factors mentioned, or through the fifth, the volume of trade, which as we have seen has tended during the last fifteen years to depress rather than increase prices.

We conclude, therefore, that the chief cause of the rise in prices during the last fifteen years has been due to the increase in the money in circulation. This increase in money has doubtless been due in turn to the increase in gold production.

Similarly, back of the other three price-raising factors we shall find other price-raising factors at work. In particular the increase in V′, the volume of checks subject to deposit, has probably been due to the concentration of population in cities; for the statistics of Pierre des Essars for the velocity of circulation of different cities in Europe can be used to show that in general the more densely populated a town the more active its bank accounts and the more rapid the velocity of bank deposits. The increase in $\dfrac{M'}{M}$ in other words, the expansion of banks, has doubtless been due in large part to the opening up of the South, and the

recent banking laws favoring small towns may have had some part in it.

A by-product of this investigation has been to show the exact proportions of the business of the country conducted in cash and in checks. It is found that the percentage of the total business of the country performed by cash has varied from 14 per cent in 1896 to 9 per cent in 1909. We thus find that the business men's impression that about 10 per cent of the business of the country is performed by cash and about 90 per cent by check, is substanitally correct.